

What is claimed is:

1. An encoding device for audio signals, comprising:
 - a matrix encoder for converting N-channel audio signals (where 'N' is an integer greater than zero) to M-channel audio signals (where 'M' is an integer smaller than 'N');
 - a matrix coefficient calculation unit for calculating matrix coefficients based on the M-channel audio signals, wherein the matrix coefficients are to be used in decoding of the M-channel audio signals; and
 - a compression unit for performing compression on the M-channel audio signals, thus producing compressed M-channel audio signals, which are output therefrom together with the matrix coefficients.
2. An encoding device according to claim 1, wherein the compression unit performs compression in accordance with the MPEG standard.
3. An encoding device according to claim 1, wherein M is set to four or five while N is set to two, so that the matrix encoder converts four-channel or five-channel audio signals to two-channel audio signals.
4. A decoding device for audio signals, comprising:
 - an expansion unit for receiving compressed M-channel signals (where 'M' is an integer greater than zero) together with matrix coefficients, so that the expander performs expansion on the compressed M-channel signals to reproduce M-channel signals; and

a calculation unit for performing prescribed calculations using the matrix coefficients on the M-channel audio signals, thus reproducing N-channel audio signals (where 'N' is an integer greater than 'M').

5. A decoding device according to claim 4, wherein the expansion unit performs expansion in accordance with MPEG standard.
6. A decoding device according to claim 4, wherein M is set to two while N is set to four or five, so that the calculation unit reproduces four-channel or five-channel audio signals based on two-channel audio signals.
7. A decoding device according to claim 4, wherein the calculation unit comprises N calculators, each of which performs arithmetic operations using corresponding matrix coefficients within the matrix coefficients so as to convert the M-channel audio signals to an audio signal of a single channel within N channels.
8. A decoding device according to claim 7, wherein each of the calculators comprises M multipliers performing multiplication using the corresponding matrix coefficients on the M-channel audio signals, and an adder for adding together multiplication results produced by the M multipliers respectively, so that the adder outputs the audio signal of the single channel.
9. A decoding device according to claim 4, wherein the calculation unit is actualized by a digital signal processor (DSP).

10. An encoding and decoding system for audio signals, comprising:
- an encoding device in which N-channel audio signals (where 'N' is an integer greater than zero) are subjected to encoding to produce M-channel audio signals (where 'M' is an integer smaller than 'N'), which are then subjected to compression to produce compressed M-channel audio signals in accordance with MPEG standard, wherein matrix coefficients are produced by performing prescribed calculations on the M-channel audio signals; and
- a decoding device in which the compressed M-channel audio signals are subjected to expansion to reproduce the M-channel audio signals, which are then subjected to arithmetic operations using the matrix coefficients to reproduce the N-channel audio signals.
11. An encoding and decoding system according to claim 10, wherein the decoding device is actualized by a digital signal processor (DSP).